ALLOLEPIS: A NEW SEGREGATE OF DISTICHLIS (GRAMINEAE)

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In a recent study to establish the relationships of the grass *Reederochloa* (Soderstrom and Decker, 1964), the authors studied the morphology and anatomy of species of the similarly dioecious genus *Distichlis*. Attention was drawn in particular to *D. texana*, a rather robust species which has been collected only rarely from the Big Bend country of Texas to El Paso and south into Coahuila, Chihuahua, and Durango, Mexico. The species was first described by Vasey (in Coulter, 1890) as *Poa texana*, based on a collection made by G. C. Nealley in 1887, apparently in Presidio Co., Texas. In the description Vasey states that all of the specimens are male and questions whether or not the species might be dioecious. Later (1893) when both male and female plants were available to him he redescribed it as *Sieglingia wrightii*, pointing out his earlier misinterpretation. The name *Sieglingia* is now valid only for the single species, *S. decumbens*. What Vasey evidently had in mind when he used the name was a group of species which now are included in the genera *Tridens* and *Erioneuron*, in which no dioecious members are found. Nine years after being first described, the species found its way into yet another genus, this time *Distichlis*, to which it was transferred by Scribner (1899). Scribner felt it belonged in *Distichlis* because of "the dioecious habit, the character of the inflorescence, the rigid subcoriaceous glumes, long-exserted styles protruding from the apex of the floret, and grains enclosed in the coriaceous base of the palea." This disposition was accepted by Hitchcock in the first edition of *Manual of the Grasses of the United States* and in the 1950 edition revised by Agnes Chase.

Since the time of Scribner and Hitchcock, characters of leaf anatomy have come to play an increasingly important role in elucidating the true relationships of grasses. Studies of *Reederochloa*, for example, showed that the leaves of that genus possess peculiar bicellular microhairs in which the enlarged bases are actually sunken in the epidermis. Such hairs are found also in *Monanthochloë* and, with the exception of *D. texana*, in all species of *Distichlis*. The genera with this type of microhair share many other anatomical as well as morphological characters, such as the dioecious habit and coriaceous many-nerved lemmas and glumes, which unite them into a close, natural association. *Distichlis texana* (for the genus and indeed for this whole alliance) is striking because its bicellular microhairs are not sunken but are of the normal eragrostoid type, similar to those found in *Eragrostis, Muhlenbergia, Sporobolus*, etc. This dissimilarity of bicellular microhairs prompted a more thorough look at *D. texana* and the other members of the genus. Our studies revealed that this species differs remarkably in fundamental anatomical and morpho-

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logical characters and has indeed been misplaced even in *Distichlis*. Now, after 65 years in the latter genus, we choose to remove it and recognize it separately as a new genus, *Allolepis,* the fourth generic name to be associated with this interesting grass.

Allolepis Soderstrom & Decker, gen. nov. Perennis dioica stolonifera; culmi ascendentes vel decumbentes, vaginae forte costatae, glabrae; ligula brevis, ciliata; rami paniculae appressi vel ascendentes, plerumque ad basin floriferi. Planta masculina: Spiculae ovato-lanceolatae vel lineares, stramineae, illustres; glumae ovatae, hyalinae, glabrae; gluma prima 1-nervia, quam secunda paulo brevior; gluma secunda 1(–3)-nervia; lemmata forte 3-nervia, glabra, illustria; palea lemma aequans vel quam lemma paulo longior, linearis, glabra; antherae 3, flavae. Planta feminea: Spiculae ovato-lanceolatae, teretes vel paulo compressae, stramineae; glumae ovatae, coriaceae, glabrae, marginibus membranaceis; gluma prima quam secunda paulo brevior et angustior, forte 1-nervia (interdum cum ampliis nerviis indistinctis); gluma secunda 3-nervia (interdum cum ampliis nerviis indistinctis); lemmata forte 3-nervia (interdum cum ampliis nerviis indistinctis), glabra, ovata, coriacea, marginibus scariis; palea quam lemma paulo brevior, a latere visa supra versus angusta et linearis, basin versus curvata, glabra; lodiculae 2, cuneatae.

Type species: **Allolepis texana** (Vasey) Soderstrom & Decker, comb. nov. *Poa texana* Vasey, Contr. U.S. Natl. Herb. 1:60. 1890. *Sieglingia wrightii* Vasey, Contr. U.S. Natl. Herb. 1:269. 1893. *Distichlis texana* (Vasey) Scribn., U.S. Dept. Agri. Div. Agrost. Cir. 16:2. 1899, based on *Poa texana* Vasey.

The following description of *A. texana* is intended to supplement previous descriptions of this taxon which have been scanty and based on fewer specimens than those available at this date: Perennial, dioecious, stoloniferous, the stolons glabrous, strongly ribbed, 1–4 mm broad, to 25 cm long; culms loosely ascending or spreading as stolons, 10–70 (25–65) cm long (from point of rooting to base of inflorescence), glabrous; nodes 3-several, glabrous; lower sheaths shorter than the internodes, strongly ribbed, glabrous; blades flat when dry, sometimes involute toward the tip, to 30 or more cm long, 2.5–6 (4–5) mm wide, glabrous above and below, becoming scaberulous toward the tip, the edges scabrous; ligule short-ciliate from an inconspicuous membranous base, 0.5–1.4 (0.5–1) mm long; inflorescence a panicle, 3–23 (10–17) cm long, 1–6 (1–3) cm wide, consisting of stiffly appressed or ascending branches 3–6 cm long, usually floriferous to the base, the panicles containing as many as 70 spikelets; lodicules 2, cuneate in outline. Male plant: Spikelets ovate-lanceolate to linear, stramineous, lustrous, 9–23 (10–15) mm long, 3–8 (3–6) mm wide, up to 20 florets per spikelet, apparently not disarticulating; glumes broadly ovate, hyaline, glabrous, the midnerve scabrous; first glume a little shorter than the second, ca. 4–5 mm long, 1-nerved; second glume ca. 1 mm longer than the first,

1(–3)-nerved; lemmas of lower florets 5–5.5 mm long, strongly 3-nerved, glabrous, lustrous; palea equal to or a little longer than the lemma, linear, glabrous, the keels minutely ciliolate; anthers 3, yellow, 3–3.5 mm long. Female plant: Spikelets ovate-lanceolate, terete or only slightly compressed, stramineous, 1–2 cm long, 2.5–3.5(3) mm wide, with up to 8 or 9 closely imbricate florets per spikelet, apparently not disarticulating; glumes broadly ovate, coriaceous with broad scarious margins, glabrous, the midnerve scabrous; first glume a little shorter and narrower than the second, ca. 7–9 mm long, strongly 1-nerved (up to 4 or 5 additional faint nerves may be present); second glume 3-nerved, with an additional 1 or 2 pairs of faint nerves sometimes present; lemmas of the lower florets 7.5–10 mm long, strongly 3-nerved, glabrous, midnerve scabrous above, broadly ovate, coriaceous with irregular scarious margins; palea a little shorter than the lemma, narrow above and strongly bowed out below, the margins overlapping, glabrous, the keels ciliolate.

Specimens examined. United States, Texas. Without precise locality (Presidio Co. ?): *Nealley s.n.,* in 1887 (Isotype, US: ♂ plants, basis of *Poa texana* Vasey). Brewster Co.: Castalon, *Silveus 648* (TAES, TEX, US). Jeff Davis Co.: *Brown 53–240* (TEX: cultivated in Univ. Texas grass garden); *Brown s.n.,* 25 July 1949 (TEX); *Brown s.n.,* 1 Aug. 1950 (TEX: grown in Univ. Texas grass garden, cytological voucher); *Hinckley 4571* (US); *Hinckley* & *Hinckley 316* (US); Limpia Canyon, *Nealley s.n.,* in 1892 (US); *Warnock 7942* (LL, SMU, TEX); *Warnock 8039* (LL, SMU); *Warnock 10187* (LL, SMU); Valley of the Limpio, *Wright 2038* (US: ♀ plant, basis of *Sieglingia wrightii* Vasey). Presidio Co.: *Nealley 136* (TAES); *Nealley 137* (NY, US); near Presidio, *Nealley s.n.,* in 1892 (US); *Silveus 737* (US); *Warnock 158* (TEX, US).

Mexico. Chihuahua: 5 km west of Cd. Camargo, *Harvey 1412* (US). Coahuila: Saltillo, *Palmer 507* (NY, TAES, US). Durango: Torreón, *Hitchcock 7541* (US).

A photograph of a single plant of *Allolepis* clearly showing its strong stoloniferous habit is given by Silveus (1933). There is also an excellent illustration of the habit and of the male and female spikelets (Scribner, 1901), and a sketch of the female panicle and spikelet (Hitchcock, 1950).

Allolepis can at once be distinguished from *Distichlis* by the absence of scaly rhizomes and presence of long, thick stolons. *Distichlis* rarely produces narrow stolons but, when found, they are in addition to the scaly rhizomes which are so characteristic of the genus. Beetle (1943) has even recognized as a variety of *D. spicata* some California plants with stolons, *D. spicata* (L.) Greene var. *stolonifera* Beetle, but these are apparently produced only under certain conditions and do not seem to be correlated to any degree with other characters. The length of the stolons in *Allolepis* is hardly apparent on herbarium specimens which represent only segments of the whole. Silveus (1933) states that they are about 10 ft long and Barton Warnock (pers. comm.) of Sul Ross State College, Alpine, Texas, has observed in the field that some of them are easily 50 ft long. The blades of *Distichlis* are narrow, involute, pungent and arranged on the culm in an obvious distichous manner, hence the generic name. In contrast, those of *Allolepis* are flat, longer and broader, and not arranged in such a distinct distichous fashion.

The male and female spikelets of *Distichlis* are about equal in size within the same species: each is composed of several florets, the lemmas of which are coriaceous and many-nerved. In *Allolepis,* the female spikelets are about twice as large as the male spikelets and the texture and nerves of the lemmas in each are distinct. Lemmas of the male spikelets are thin in texture and strongly 3-nerved whereas those of the female spikelets are coriaceous and 3-nerved but occasionally with an additional pair of faint nerves. The 3-nerved condition of the lemmas is quite unlike that of the *Distichlis-Monanthochloë-Jouvea-Reederochloa* alliance in which the lemmas of both sexes are consistently coriaceous and many-nerved. The palea offers a further distinction between the two genera, for the keels of the palea in *Distichlis* are winged but in *Allolepis* they are not.

The dissimilarity of lemmas between the sexes of *Allolepis* has suggested its new name, a synthesis of the Greek words *allo* (different) and *lepis* (scale, or lemma).

The most prominent difference in the leaf epidermis between *Allolepis* and *Distichlis* is the microhair—normal eragrostoid in the former (fig. 1A), bulbous-based and sunken in the latter (fig. 1B). The shape of the siliceous cells is irregular ("potatolike") in *Distichlis* (fig. 1D), predominantly dumbbell-shaped in *Allolepis* (fig. 1C). The epidermal surface of *Distichlis* is rough and irregular due to the presence of many papillae (fig. 1B) while that of *Allolepis* has few or no papillae and hence is relatively smooth. A few minor differences are also encountered in the leaf cross section. Arm cells (fig. 1A) are conspicuous in each bundle of an *Allolepis* leaf but not obvious, when present, in *Distichlis*. The bulliform cells of *Allolepis* (fig. 1A) are relatively large in tall girders and the outer bundle sheath is elongate in outline and complete on most of the bundles. The bulliform cells of *Distichlis* (fig. 1B) are relatively small and in short girders and the outer bundle sheath is generally round in outline and complete only on the smaller bundles.

From published chromosome reports, no cytological distinction can be made between the two genera. Brown (1951) has listed a count of 2n=40 for *Distichlis texana* (*Allolepis*). Similar counts have also been given for *D. spicata* from California material (Stebbins & Love, 1941) and Argentine material (Rahn, 1960), and for *D. stricta* from Canadian material (Bowden, 1960) and California material (Stebbins & Love, 1941). The basic number of x=10 indicates these genera do not belong in the traditional tribe Festuceae but rather to the eragrostoid complex, as substantiated by the leaf anatomy and other studies (Soderstrom and Decker, 1964).

Distichlis, Reederochloa, Monanthochloë, and *Jouvea* are plants of saline habitats. The latter two are strictly littoral or maritime; of the former two, *Reederochloa* occurs in alkaline inland flats, and *Distichlis* occurs both along the coasts and in saline areas of the interior. Information regarding the habitat of *Allolepis* has been difficult to obtain, especially since so few botanists have collected it. To our knowledge the only

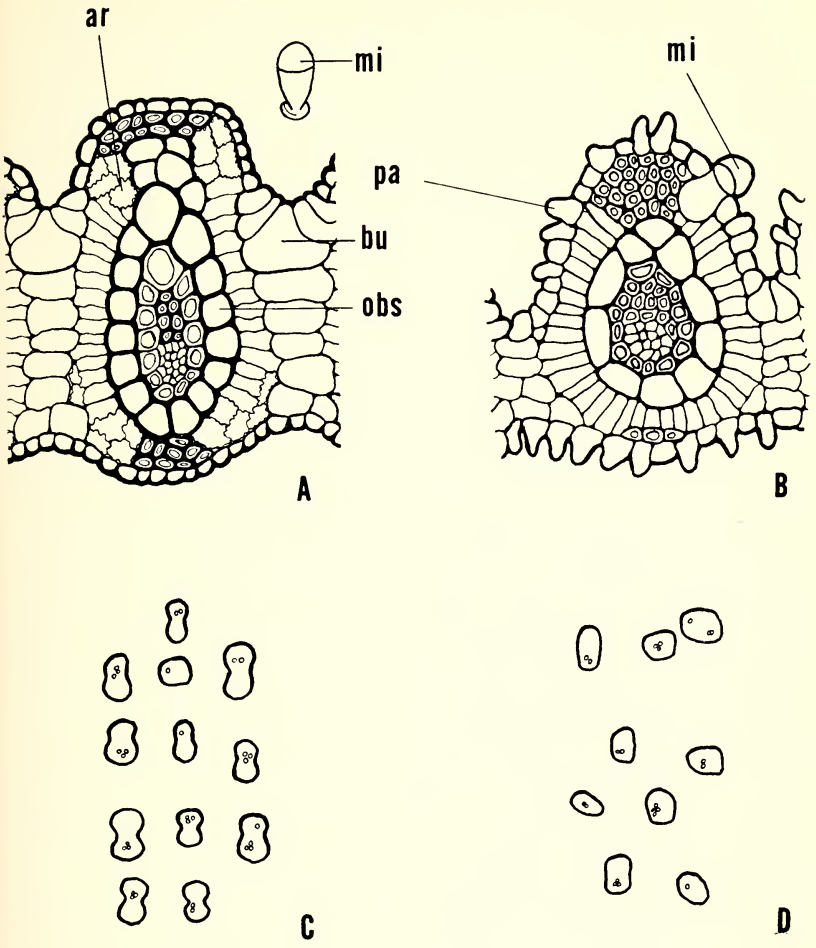

FIG. 1. A, B, Transverse sections of grass leaves; C, D, portions of the bands of siliceous cells over the costal regions on the epidermis of grass leaves; A, C, *Allolepis texana* (*Silveus 648*); B, D, *Distichlis spicata* (*Reeder & Reeder 3074*). The illustrations were done with the aid of a microprojector and are at various magnifications: ar, arm cell; bu, bulliform cell; mi, bicellular microhair; obs, outer bundle sheath; pa, papilla.

living botanists in Texas who have collected the genus are Barton Warnock and W. V. Brown. Warnock remarks (pers. comm.)[1] that he found it growing in igneous sandy soil in a broad flat among *Hymenoclea monogyra,* and also in silty soil at the mouth of Cibolo Creek between the town

[1] We wish to acknowledge the information supplied to us by Barton H. Warnock.

of Presidio and the international bridge where it was rather abundant. Silveus (1933) gives cultivated and waste meadowlands or sand flats as the habitat. It has even been cultured successfully in ordinary loam in the University of Texas grass garden. Such information, plus the scanty data available from herbarium labels, does not indicate that *Allolepis* is a plant of alkaline areas. If this is the case, it presents us with yet another major feature to distinguish it from *Distichlis* and related genera.

Voucher specimens. Leaf cross sections and epidermis of the following specimens were examined in this study. A taxonomic revision of *Distichlis* is much needed and such a study would probably reduce the number of valid species; nevertheless the material which we examined does at least represent the genus as it occurs in North and South America.

Allolepis texana (Vasey) Soderstrom & Decker. United States. New Mexico (or western Texas): *Wright 2038,* ♂ (US). Texas: *Nealley,* in 1889, ♂ (US); *Nealley,* in 1892, ♀ (US); Castalon, *Silveus 648,* ♀ (US). Mexico. Coahuila: Saltillo, *Palmer 507,* in 1898, ♀ (US).

Distichlis hirta Phil. Chile. Batuco, *Philippi 377,* ♀ (US).

D. humilis Phil. Peru. Chuquibambillo, *Hitchcock 22450,* ♀ (US).

D. marginata Phil. Chile. Atacama, *Werdermann 997,* ♀ (US).

D. palmeri (Vasey) Fassett ex I. M. Johnston. Mexico. Sonora, *Bacigalupi 2873,* ♂ (US).

D. scoparia (Kunth) Arech. Argentina. Neuquen, *Senn 4329,* ♀ (US).

D. spicata (L.) Greene. United States. Connecticut: Lighthouse Pt., *Reeder & Reeder 2756* (YU). Massachusetts: Cape Cod, *Reeder & Reeder 252,* ♂ & ♀ (YU). Mexico. Michoacan, *Reeder & Reeder 3074,* ♂ & ♀ (YU).

D. stricta (Torr.) Rydb. United States. Utah: *Reeder & Reeder 1858,* ♂ & ♀ (YU).

D. thalassica (H.B.K.) Desv. Argentina. Mendoza, *Bartlett 19530,* ♂ (US).

D. viridis Phil. Chile. Atacama, *Werdermann 431,* ♂ (US)

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NATURAL HYBRIDIZATION BETWEEN CUCURBITA DIGITATA AND C. PALMATA

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Cucurbita digitata Gray and *C. palmata* Wats. are xerophytic, perennial species indigenous to the desert regions of southwestern United States and northwestern Mexico.[1] According to Bailey (1943) *C. digitata* is found in New Mexico, Arizona, sparingly in southeastern southern California (eastern Riverside County) and in Sonora, Mexico. It is doubtful that *C. digitata* is indigenous west of the Colorado River. In California it is found in limited roadside areas, suggesting that it was probably introduced by camper-tourists. *Cucurbita palmata* is found in southern California from the Mohave Desert southwards in interior valleys and at low elevations. It also occurs in western Arizona and northern Baja California, Mexico. In the area adjacent to the Arizona-California border and directly east of the Colorado River the species are sympatric.

Each species has 20 pairs of chromosomes (McKay, 1931). They also have similar growth patterns. The root systems have large fleshy storage roots which enable the plants to survive prolonged periods of high temperatures and extremely arid conditions. Vine growth is rapid under favorable conditions of moisture and temperature. Adventitious roots are produced at intervals on the nodes of the runners, and under favorable moisture conditions these roots are able to develop into tuberous roots which when separated from the mother vine will establish another plant. This asexual method of propagation produces a clone with the individual plants grouped in colonies. *Cucurbita digitata* and *C. palmata* are prolific producers of fruit and seed. The fruit is a relatively hard-shelled, round pepo, two to three inches in diameter, and contains from 200 to 600 seeds. Reproduction by seed, however, is probably limited because of low seed and seedling survival in the environments to which these species are adapted.

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